

Customer No.: 31561
Docket No.: 11053-US-PA
Application No.: 10/707,457

REMARKS

Present Status of the Application

Claims 11-20 are pending at the current stage and all amended to more clarify the claimed subject matter of the present invention without introducing any new matter. For at least the foregoing reasons, applicants respectfully submit that the amended claims 11-20 patentably define over prior art of record and reconsideration of this application is respectfully requested.

Discussion of amendment made to the subject matter of each claim

To more clarify the subject matter of each claim, "A (The) semiconductor circuit component," is amended to "A (The) discrete semiconductor circuit component."

Discussion for objection to claims under 35 U.S.C.102(e)

1. Claims 11,13-16 and 19-20 are rejected under 35 U.S.C.102(e) as being anticipated by Hosaka(US patent no. 6,475,897, hereinafter referred to Hosaka) Hosaka disclose a semiconductor device (Fig.2b) that contains a semiconductor circuit component comprising a circuit die(11), said circuit die having at least one electrical contact area(12) for connection to the packaging of said semiconductor circuit component, said at least one electrical contact area being bond to the

corresponding lead of said packaging by metallic material formed by a metal ball (14)

*of prescribed feed melted, wherein the metal ball contains alumina, tin, or lead and
there are more than one metal ball*

In response thereto, applicants respectfully transverse the objection based on the following arguments and thus withdrawal of objections to the claims 11, 13-16 and 19-20 is respectfully requested. First of all, applicant would like to emphasize the features of the present invention again as follows. One fundamental distinction between the subject matter of the present invention and the references cited by the examiner is the fact that the present invention is aimed primarily at the application to discrete circuit components, and in particular, those applications requiring power, more than signal handling. Feeds of metal balls to the semiconductor die of the target device of the present invention provides improved power handling capability due to advantages such as the metal bonding described. This is clearly seen from the descriptive text of the specification wherein the preferred embodiment describes a discrete circuit component of two electrodes.

Furthermore, from Fig. 2A and 2B, as well as col. 3, lines 26-29 in Hosaka, there only discloses pad 12 and bump 14. In the other hand, from the paragraphs [0010] and [0032] in the present invention, as the size of the bump 122 can be easily controllable by selecting the size of the balls 120 and shapes of all the bumps 122 for

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the entire matrix can be within a high degree of uniformity, an object of the present invention to provide a method of fabricating metal bonding for semiconductor circuit components between die electrical contacts and package electrical leads that is reliable, can be accomplished. Therefore, the independent claim 11 in the present invention contains a principle feature of "by metallic material formed by a metal ball of prescribed feed" so that bonding implemented by the present invention can be more reliable over Hosaka. That is, Hosaka fails to teach, suggest or disclose "by metallic material formed by a metal ball of prescribed feed" as claimed and featured in the independent claim 11. In other words, the independent claim 11 in the present invention is not anticipated by Hosaka.

With respect to dependent claims 13-16 and 19-20, those claims are patentable in view of Hosaka as a matter of law for at least the following reason they contain all features of their base independent claim 11.

Discussion for objection to claims under 35 U.S.C.103(a)

2. *Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hosaka in view of Dias (U.S. Pub. No. 2003/0109080)*

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In response thereto, applicants respectfully transverse the objection based on the following arguments and thus withdrawal of objections to the claims 12 is respectfully requested. First of all, Dias disclosed a process for flip-chip underfill that was also suitable for large pin-count IC devices. Even if bump comprised of copper taught by Dias is incorporated into Hosaka, this incorporation still fails to teach, suggest or disclose the feature of "by metallic material formed by a copper ball of prescribed feed" as claimed in the amended claim 12. Moreover, as claim 12 is dependent claim, it is patentable over Hosaka in view of Dias as a matter of law for at least the following reason they contain the preceding mentioned feature of their base independent claim 11.

3 Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosaka in view of Cho (U.S. 5,985,694)

In response thereto, applicants respectfully transverse the objection based on the following arguments and thus withdrawal of objections to the claims 17 and 18 is respectfully requested.

First of all, Cho was directed toward a method of making chip-to-package interconnections, or, "first-level packaging interconnections" for packaging

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semiconductor die, which allow semiconductor dies to be electrically connected to pads disposed on one surface of a substrate (FIG. 7). On the other hand, the device of the present invention is preferably suitable for semiconductor dies having electrical contacts at opposite surface of the die itself.

Another distinctness between the present invention and Cho is the fact that Cho's method utilized solder spheres (210, counterpart of the prescribed feeds of metal balls of the present invention) to provide the electrical contact for the semiconductor die 100 to a substrate 300, which then provides the BGA landing pads (310) as the external electrical contact terminal for the packaged device (FIG. 7). By contrast, the metal balls of the present invention may be used to provide the final and high-power contact terminal (as disclosed in the last sentence in the "ABSTRACT") for the packaged semiconductor device, preferably a power discrete component such as a power diode or transistor.

Moreover, the examiner alleged that, from col. 2, lines 65-67 and col. 3, lines 10-13, in Cho, bumps with non-uniform shapes are implemented in the IC package and that the bumps incorporated into Hosaka render the claims 17 and 18 "obvious." However, this incorporation still discloses only a plurality of same space-arranged metal bumps disposed on one surface of a substrate, rather than those disposed on the two opposite surfaces of the substrate in the present invention. In addition, this

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incorporation still fails to teach, suggest or disclose "second metal bumps with non-uniform shapes," as claimed and featured in claims 17 and 18.

In brief, all the references cited by the examiner did not teach such a power-handling benefit for discrete circuit components, as discussed in the all preceding sections. The present invention is believed to be placed in an allowance condition. As disclosed in the amended claims 11-20, the subject matter claimed in the present invention is limited from a general semiconductor circuit component to a discrete one. The applicant believes that discrete circuit components featuring metal bond for the contact terminals thereof and therefore are capable of much improved power-handling capability is patentable in view of the all references.

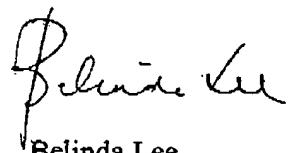
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CONCLUSION

For at least the foregoing reasons, it is believed that all the amended pending claims 11-20 of the present application patently define over the prior art and are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

Respectfully submitted,

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